March 31, 1999

Mr. Ralph Augustin
Chief, Regulatory Branch
U.S. Army Corps of Engineers
St. Paul District
190 Fifth Street East
St. Paul, MN 55101-1638

RE: Crandon Mine Project; Comments on the Surface Water Mitigation Plan and the Monitoring Plan: 94-01298-IP-DLB

Dear Mr. Augustin:

In response to your letter dated February 16, 1999, below are comments relating to Nicolet Minerals Company's (NMC) Surface Water Mitigation Plan and Monitoring Plan (Appendix F of the Mine Permit Application). Many of the comments were discussed at the U.S. Army Corps of Engineers (COE) and NMC meeting held in Rhinelander on February 1 and 2, 1999, but are reiterated here for the record. Many of the comments are made to simply clarify particular points within the Plans. More comments will be forthcoming regarding these Plans pending additional reviews by others within the United States Environmental Protection Agency (EPA) and potential changes to the Plans by NMC resulting from groundwater modeling.

**Surface Water Mitigation Plan:**

Chapter 2, Mitigation Framework:
1) Is this Plan only meant to deal with the mitigation of surface water bodies that lost water inflow due to mine dewatering, or will other sources of surface water loss be mitigated as well? For instance, if surface drainage patterns normally would feed a certain creek but due to construction of the Tailings Management Area (TMA), the runoff that would have naturally flowed into that creek now goes to a retention basin and gets discharged into a different portion of that creek or into a different water body, would impacts need to be mitigated? While this water loss may be minimal to the creek itself, it, in addition to losses via groundwater drawdown, may become more significant. Other anticipated impacts to surface water (i.e., increase in sedimentation) not attributed to groundwater dewatering but that would require mitigation should also be mentioned within this Plan.

2) Page 3: Within the 2nd paragraph, under the guiding principle of the mitigation plan, it states,

"The department may not issue an approval under s. 281.17(1) if the withdrawal of groundwater for prospecting or mining purposes or the dewatering of mines will result in the unreasonable detriment of public or private water supplies or the unreasonable detriment of public rights in the waters of the state. No withdrawal of groundwater or dewatering of mines may be made to the unreasonable detriment of public or private water supplies or the unreasonable detriment of public rights in the waters of the state."

As federal agencies with tribal trust responsibilities, the COE and EPA must look beyond the "waters of the state" and examine the potential impacts to "waters of the tribes". The Sokaogon Chippewa Community has water quality standards covering waters within the Mole Lake Reservation and these are not recognized within this document. Mitigating to the state's public rights stage or public rights flow may or may not adequately address tribal concerns. This needs to be addressed within this Plan.

3) Page 5: The last sentence of the last paragraph needs clarification. It is unclear as to what a delay in full recovery of the groundwater table by 25 to 50 percent means in this case. This seems to indicate that the use of groundwater as mitigation water will be contributing to groundwater drawdown. How is this reflected in the groundwater modeling to predict overall groundwater drawdown that will be in need of mitigation?

Chapter 3; Categorization of Surface Water Bodies for Permitting:
4) Bodies of water that are significant tribal resources, such as Swamp Creek and Rice Lake, should be advanced a level within the mitigation tiered approach. These criteria should be included within Figures 3-1 and 3-2, similar to the dissolved oxygen issue with Rolling Stone Lake in Figure 3-1. This Plan needs to address the Tribal Water Quality Standards in place by the Sokaogon Chippewa Community.

5) Is there an upper limit for Public Rights Flow (PRF) or Public Rights Stage (PRS)? Are there upperbound flows or stages that should not be exceeded for any length of time or is the interest only in low flow/stage? With the addition of the Soil Absorption System, and the need for mitigation only during low flow stages, as indicated in the last sentence within Chapter 2 of this Plan, this seems to create the possibility that Swamp Creek and downgradient water bodies (i.e., Rice Lake) may experience a higher flow/stage than normal for longer periods of time. The result may be more eroded banks, colder water, more sediment transport, etc.

Chapter 4; Trigger Criteria:
6) Page 12: How often will PRS/PRF be monitored? Continuously, Weekly, Monthly? Will alternate trigger criteria be established? PRS/PRF may not be adequate indicators in all situations. Biological and chemical criteria should be established. How will the destruction of beaver dams in the area impact the determination of PRS/PRF trigger criteria? Will there be different PRS/PRF thresholds with and without beaver dams?

Chapter 5: Engineering Design Considerations:
7) Page 18; Section 5.2.1: The first paragraph states that the potential mitigation water sources

during operations include treated mine water, well water and other surface waters. What other surface waters are/were being considered? Is this mentioned elsewhere within the Plan? If the use of surface water for mitigation purposes is no longer being considered, it should be stated here.

8) Page 18/19; Section 5.2.1: The last sentence of this section states, "There will be no impact on the flow within Swamp Creek due to the use of the well, since the Level I and II hard water bodies that are being mitigated flow into Swamp Creek.". This seems like circular reasoning. If the groundwater in the area of the mitigation well were to naturally discharge into Swamp Creek, but is taken out before it can do so and is put in elsewhere along the creek to compensate for groundwater lost to the system due to dewatering, then groundwater taken out of the system near the mitigation well to compensate for the dewatering is instead lost to Swamp Creek. While the amount lost via the groundwater well may be minimal and may not be able to be observed in Swamp Creek, impacts may still occur. There is similar circular reasoning within Section 6.1.1, "This groundwater will replace the groundwater that has been taken out of the hydrologic water balance of the respective surface waters due to mine inflow", does not clarify this issue any further. For mitigation wells north of Swamp Creek, the Soil Absorption System will help keep this loss in balance.

9) Page 19; Section 5.3: The first paragraph of this section states that, "Since this groundwater is the same water which would naturally recharge these water bodies, treatment will not be required prior to mitigation discharge." The use of "will not" is premature. Testing is needed periodically to determine differences/similarities in water quality parameters between the well water and the receiving body. According to EPA-NPDES permit writers, a discharge permit will be required for these discharges (Section 5.5.4 of this Plan says permits will not be necessary). Is groundwater from all areas around the plant site similar, i.e., is groundwater north of Swamp Creek identical in parameters to groundwater south of Swamp Creek?

Chapter 6; Practical Worst Case (PWC) Level I and Level II Water Body Mitigation System Design:

10) Page 27; Section 6.1.2: If the projections made within the third paragraph, regarding inflow rates are too high, the amount of treated water available at any one time are too low, and/or the amount of mitigation water needed are too low, what contingencies are planned or are possible?

11) Page 30; Section 6.1.3.5 and Figure 6-8: This section states that the mitigation water delivery system to the receiving body will be via a below-grade pipeline terminating with a diffuser pipe secured by an articulated concrete mat on the bottom of the water body. Will this method disturb the sediment in the immediate area of the discharge, eventually stripping all sediment away near and around the pipe's outlet? If the sediment was impermeable "muck", will stripping add to potential drainage/connectivity changes between the lake/stream bottom and underlying permeable glacial deposits?

Chapter 7; Mitigation System Selection and Design for Level III PWC Bodies

12) Page 32, second paragraph: The explanation of mitigation of Creek 11-4 and Martin Springs

again uses circular reasoning. If the drawdown from the mitigation well for Creek 11-4 and Martin Springs impacts Pickerel Creek, then the wells north of Swamp Creek can be pumped more to compensate for any water lost to Pickerel Creek. But this water will be added a mile or so upgradient from where it should have entered at the confluence of Creek 11-4 and Pickerel Creek. Wouldn't this therefore cause more drawdown in the area north of Swamp Creek and therefore less water reaching Swamp Creek? Is this just a transfer of the problem?

13) Table 7-1: As a general comment on these water bodies, will the groundwater drawdown cause any other impacts besides decreases in water volume? For instance, with the increased loss of water from these bodies of water through their pervious substrates, will this cause compaction or consolidation of sediment materials (depending on particle size) on the lake/stream bottoms more so than that which would occur under natural conditions? If there is an impact, will the lake/stream bottom be able to return to pre-mine conditions when the loss to groundwater is reversed or lessened?

Chapter 9; Mitigation System Operation:
14) Page 37, Section 9.2: The fifth paragraph states that the key criteria for initiating mitigation at any of the Levels is the observation of drawdown in a key well or wells (sentinel wells). What is the possibility that the well was screened improperly or misplaced, etc., and may miss the warning signs that are needed to shift into mitigation? Back-up signals such as uncharacteristic water levels within the water body or alternate sentinel wells need to be established. Also in the last sentence it states that if a Level II lake is not groundwater fed and the sentinel well(s) signal a hydraulic connection is established, it will be upgraded to a Level I water body if precipitation data indicates an impending drought. Are there scenarios where a Level II water body would need mitigation even if a drought is not impending?

Chapter 10; Mitigation System Impacts:
15) Page 39, Section 10.1: This section states that for creeks and wetlands, the pipelines will go under these bodies using horizontal drilling. After the mining is complete and the pipelines are abandoned in place, can leaks/breakage in the pipeline that may occur beneath the creeks/wetlands cause these areas to loose water along the pipeline, giving the water a conduit to drain away from its source?

16) Page 39, Section 10.1.1: The first paragraph states, "It is anticipated that after construction, the corridors will begin to revert back to their original state and native vegetation will colonize the disturbance area. It is not clear if all areas will be reseeded or just areas in threat of erosion, while other areas are left to recolonize on their own. Will the areas be monitored to assure proper growth and to determine the presence or absence of invasive species?

17) Page 42, Section 10.2.1: The first paragraph states that the mitigation discharge points for these two water bodies (Creek 19-14 and Hoffman Springs/Creek) are at the headwaters. Then it states that the flow in the creeks will be mitigated along the entire reach of the creek/spring. Will the mitigation water be adding more water to the headwater areas of these streams than would be there naturally? Would this cause a change (however small) in the

flow/depth/width/etc. to the areas upstream in these bodies from the areas where the loss of the water is occurring in these bodies? For instance in Creek 19-14, if 15gpm is being added at the headwaters where the water being lost at that particular location is say only 3 gpm, but the 15gpm will correct for losses occurring 200-300 feet further downstream, will impacts be caused by the "frontloading" of the mitigation water instead of mitigation throughout the length of the water body? Mitigation throughout the length of the water body probably is not practical but impacts should be determined regarding the "frontloading".

18) Page 43, Section 10.2.3: In the first full paragraph, third sentence, it is incorrect to generalize that invertebrates are only associated with the surface water for a segment of their life cycle. This state is true for some, but not all, aquatic invertebrates. Also, in the third paragraph, second sentence, it states, "The groundwater drawdown may result in a greater exfiltration rate through the bottom of these surface waters. See comment 13 above. Also, how will this "exfiltration" rate increase impact the benthic community i.e., will the downward gradient force these organisms deeper into the sediment? Will this then also impact available nutrients for fish?

19) Page 43/44, Section 10.2.3: In the last paragraph on Page 43, the second sentence states, "The limitations placed in this permit will be set, as a minimum, to protect the most sensitive organisms associated with these surface waters." CMC (Crandon Mining Company), and now NMC have routinely stated this here and in other documents. What exactly does this mean? Is the most sensitive species for each stream reach, for each wetland and for each lake identified? Does "protect" mean no mortality above natural conditions (and have natural conditions been adequately defined) or is some impact acceptable? Does "protect" mean over a short-term or a long-term? Does meeting the discharge standards as set by the State satisfy this statement even without adequate monitoring of species within the monitoring plan? How do the Tribal Water Quality Standards as set by the Sokaogon Chippewa Community fit into this statement?

20) Page 44, Section 10.2.3: The last paragraph of this Section states, "With the mitigation program in place, no unreasonable impacts are expected." For this Plan, a section should be devoted to problems that could occur with the program and associated potential impacts.

21) Page 44, Section 10.2.4: This Section states that after the Zinc phase is completed, that surface water mitigation rates will be reduced. With less inflow (less to dilute), but in contact with higher concentrations of pyrite (from the outer edges of paste backfilled stopes), will the mine water need to go through additional or a different type of treatment prior to being used in the surface water mitigation program?

22) Figures 6-4 and 6-5: For the water bodies that are to be supplied by the same pipeline (prior to it branching off to the individual lakes), is it assumed that the pipeline diameters are of such that the practical worst case conditions can be met for all the water bodies at once. For instance if the PWC was experienced for Little Sand Lake, Deep Hole Lake and Duck Lake, all at the same time, would the 5" pipeline leading out of the plant site be able to handle the volume needed to mitigate all the demands? How much of a contingency with regard to pipe volume versus water needs is there? For instance, if the PWC for Deep Hole Lake is 35gpm but the

estimates were wrong and 50 gpm were needed during certain periods, would the 1½" pipeline servicing Deep Hole Lake be able to meet the demand?

23) Appendix A, Section IV, Page A-6: Even though this is a WDNR letter dated 4/17/97 to CMC, this comment applies to the entire Surface Water Mitigation process. Biological monitoring should be used as a trigger (at least a trigger for further study) for all water bodies, and not just springs as recommended here.

**Crandon Project Environmental Monitoring Plan**
(Appendix F of the Mine Permit Application)

Chapter 1
General Introduction Comments:
Habitat, as structured by in stream and surrounding topographical features, is a major determinant of aquatic community potential (Southwood 1977, Plafkin, et al. 1989 and Barbour and Stribling 1991). Both the quality and quantity of available habitat affect the structure and composition of resident biological communities. The Plan does not provide for the monitoring of physical habitat characteristics of the lakes, streams and wetlands mentioned. What about possible changes in stream bank, channels, and vegetation due to increased or decreased flow, loss of vegetation cover, and increased erosion due to mine construction, operations or decommissioning? All of these things impact the quality of water and the integrity of biological communities. Also, there is no mention of what actions will be taken when some specific contaminant level or change in groundwater, surface water, or biological organism is observed. If X number of fish are found to contain Y level of contaminant, what are the actions to be taken by the mining company, by the State, or by others? The only action this Plan advocates is the possible need for further investigation. Are there any levels which would require a plant shutdown, immediate mitigation, etc.?

1) Page F-6, Section 1: second paragraph: This is similar to what would be included in a plant's ISO 14000 Plan - to insure that employees from the top to the bottom are involved in environmental matters. Does NMC or Rio Algom have an ISO 14000 Plan for this project or one covering all Rio Algom Projects?

2) Page F-6, Section 1; fourth paragraph, fifth bullet: Does adding "as required" to the end of the sentence indicate that any environmental situation or incident that may occur, but not result in a non-compliance, will not be reported? Who will be the judge of "which may result in ..."?

3) Page F-7, Section 1; second paragraph: This Plan addresses monitoring during the construction, operation and long-term care and maintenance period, but does not fully address pre-construction/baseline monitoring needs. While monitoring has been done in the past, no continuous monitoring of conditions has been conducted around the project area making determination of baselines very difficult not only for surface water/groundwater constituents and

flows/levels, but also for biological components of the project area. Pre-construction monitoring needs to be discussed in fuller detail throughout this Plan and needs to be initiated as soon as possible. This need should be mentioned within the Introduction as well.

4) Page F-7, Section 1; second paragraph: This paragraph mentions potential changes to the Plan in the future and states that changes will be submitted to the WDNR for review. This Plan should also include issues regarding federal concerns, such as trust resources and wetland issues, and any changes to the Plan need also be submitted to the COE for approval. Also see comment no. 38 below.

5) Page F-8, Section 1; First Objective: The First Objective of the Plan is to verify compliance. Much of this will be accomplished via groundwater monitoring. Will not being able to sample a well due to drawdown be a recurrent monitoring status, particularly for wells around the plant site, orebody and TMA or will these wells be replaced or drilled to depths where they are not expected to go dry?

Chapter 2: Groundwater
6) Table 2-1: Page F-14: what is the difference between wells CMC-SP-06 and 05A?

7) Tables 2-1 and 2-2 and Figure 2-2: these indicate that the monitoring wells to be sampled surrounding the Plant Site are all Water Table (WT) wells. Are any deeper wells or well nests to be sampled for water quality around this area? WT wells seem like they would go dry and leave areas unmonitorable. Also, wells should be proposed for all areas of the Plant Site, including the acid storage tank area and fuel storage area. Also, these Tables and this Figure and all of Section 2.1.1 do not indicate that monitoring wells will be located around the explosives storage area located on the northeast side of the Plant Site. Since potentially hazardous materials will be stored here and potentially spilled in this area, the groundwater should be monitored. This plan also needs a Figure depicting the depths of the wells in conjunction with the formation in which they are screened, and also showing the depths of the TMA, the mine, etc.

8) Page F-26, Section 2.1.1.4: Mine Groundwater Monitoring: second paragraph states that during operations, groundwater flow in the glacial overburden will be directed toward the mine, thus eliminating the potential for constituent migration from the mine toward the Mandatory Intervention Boundary (MIB) and Design Management Zone (DMZ). Then it states that after closure of the mine, groundwater flow will resume a generally east to west flow path across the ore body subcrop. This paragraph should also address what will occur if the mine is temporarily shut down prior to a full closure of the mine. Will a short turnoff of the pumps be enough to revert the flow of groundwater back to the east to west pattern? If the pumps are off, how long before the flow returns from east to west? Groundwater monitoring will need to be conducted on all sides of the ore body, TMA and Plant Site to compensate for the potential changes in groundwater flow direction.

9) Page F-26: Section 2.1.1.5, SAS Monitoring, the second paragraph states that driven sand points DSP-24 through 27 are located between SAS cells and will be monitored to evaluate

potential gw mounding at the water table. According to Figure 2-4, these sand points are downgradient of their respective SAS cell and not located between cells (except for SP-24 which is between cells B and C within Area A). Eight downgradient wells from six SAS cells does not seem sufficient to monitor and determine groundwater quality between the SAS and eventual discharge to Swamp Creek. Of these eight, there is only one well nest set up to monitor two formations. More monitoring should be required for this area. What activity will be occurring in Area B2? Will any monitoring be needed in that portion of the SAS site?

10) Page F-30: Section 2.1.2, Monitoring Well Construction: This section states that the water table wells at the SAS will be constructed with 10 foot screens while at all other locations the water table wells will have 15 foot screens. Will a 15 foot screen, during times of high water levels, allow too much water to enter the well, therefore possibly diluting any sample so that low level contamination may be missed during routine monitoring? Conversely, during times of low water levels, will the large amount of open-air screen be enough to impact the sampling results?

11) Page F-31; Section 2.1.4: The third paragraph of this section states that NMC believes it is not necessary to complete background monitoring for organic parameters. A good baseline will have monitoring covering all parameters in which it is possible and plausible for the project to release sometime during its operations, of which organics is, or should be, included. Organic parameters should be included in the baseline sampling as well as in periodic sampling during the project. The paragraph states that the fuel oil storage area need not be monitored because other similar storage areas at other plants are not monitored. At a minimum, wells should be proposed if the storage area(s) report a spill or any inexplicable loss of fuel. With regard to the organic compounds listed in MPA Table 4-17 (Table 4-17 of the MPA is actually a table listing the erosion control methods for the project, while Table 4-15 lists the Chemical reagents to be used on-site) is this a complete list of chemicals to be stored on site, or only those listed as "reagents"? Will any pesticides be used on site for weed control or mosquito abatement? Due to the possible release of organics throughout the plant site, groundwater should be monitored for organic parameters on some periodic basis, regardless if they are regulated under NR 140.

12) Page F-34, Section 2.1.4.1, last paragraph: Is there any possibility that a water body could be impacted without the sentinel well being impacted first? If the sentinel is not impacted but the water body is impacted, will NMC be able to claim that the impact must be caused by an outside source? Or would more wells be needed, or would impacts be assumed to be caused by the mine?

13) Table 2-6, Well NMC 401 should be added to the sentinel wells for Creek 19-14. For Duck Lake, using EX-15BL and EX-16BL seems like it would not provide early warning but a last minute warning that Duck Lake may be impacted. EX-15BL seems more appropriate as a sentinel well for Deep Hole Lake. Sentinel Wells for Creek 12-9 do not seem appropriate, except for maybe well DMB-11. For Little Sand Lake, the sentinel wells also seem too close where they will experience drawdown at the same time as the Lake. These are more like verification wells, verifying that impacts are occurring to the water body instead of early

warning sentinel wells to be used as NMC proposes.

14) Page F-36: Section 2.1.4.4: Mine Groundwater Monitoring: The 2nd paragraph states that since the groundwater flow paths will be directed toward the ore body during operations, there will be no possibility for constituent migration out of the mine, and thus, NMC proposes not to conduct quarterly groundwater quality monitoring of these wells (surrounding the mine as outlined in Figure 2-3). Since the pumped out groundwater will be sampled prior to treatment or use as mitigation water, these results should suffice in lieu of groundwater monitoring. If contaminants are found in the samples of the dewatered groundwater, then monitoring of the mine wells (if not dry) should occur to determine the origin of the contaminants. For example, monitoring well CMC-0WA3 may show contamination originating from the Plant Site, and just because the groundwater in this area is being intercepted by the mine does not make the contamination acceptable.

15) Page F-37: Section 2.1.4.5: Soil Absorption System Monitoring: The third bullet states that annual monitoring for gw quality after five years will provide sufficient data to confirm system compliance. Annual monitoring is not sufficient. Quarterly or semi-annual sampling should be required. Annual samples will not be able to detect seasonal changes in the wetlands surrounding the SAS.

16) Page F-37: Section 2.2: Mine Inflow: The second paragraph states, “In general, groundwater inflow will be calculated by subtracting the estimated amount of potable water delivered to the mine and .....”. What is the connection with the amount of potable water and the amount of groundwater inflow into the mine? Won’t the potable water be removed from the mine along with sanitary waste water and not with the dewatered groundwater?

17) Page F-38: Section 2.4.1: Regional Groundwater Level Monitoring: The third paragraph states that eight regional monitoring wells will be sampled for water quality on a semi-annual basis for indicator parameters. Eight regional wells (not including all the wells proposed for monitoring around the plant site, TMA and SAS) do not seem enough to determine if the rise of the groundwater levels in the project area back to pre-mine levels, has caused some unanticipated release of a contaminant(s) from within the unsaturated zone, unrelated to the actual mining activities. For example, will the lowering of the water table oxidize constituents within the unsaturated zone causing a release to the aquifer once the water table rises to pre-mine levels? Indicator parameters may not be able to determine if an unforeseen release has occurred, so periodic sampling of a more extensive range of parameters may be warranted.

18) Page F-41: Section 2.4.3: Reflooded Mine GW Quality Monitoring: periodic sampling for a more extensive list of parameters should be conducted throughout the five year period prior to NMC requesting a reduction in the parameter list as outlined in Table 2-5.

19) Page F-41: Section 2.4.4: Plant site quality monitoring: With the change in groundwater flow direction during pre-mining to mining to post mining conditions, how will upgradient and downgradient wells be determined within the plant site area? Wells outside of the area of

potential impact, regardless of flow direction, will need to be monitored as area background wells.

Chapter 3: Surface Water:
20) Page F-43: Section 3.1: Preconstruction Monitoring: This section states that surface water will be monitored to add to the baseline data, and in Tables within Section 3 it states a frequency of monitoring at both weekly and monthly, but this section does not state when this monitoring will begin. Will it begin immediately after a permit is granted? Can/Will it begin prior to any permit decision? Will it begin just before construction? Monitoring is recommended as soon as possible for development of a baseline database.

21) Page F-43: Section 3.1.3, Water Quality Monitoring: What is the rationale for the composite sampling procedures described in this section? If a lake is over 6 feet deep, a composite sample will be taken from 3' below surface and 3' above the bottom of the lake. So if the lake is 8 feet deep, samples from 3' and 5' would be composited. Is the object to sample the center portions of the water column as would be if the lake were 6' or less in depth or to sample as much of the water column as possible? If a lake were 12 feet deep, a sample from 3' below surface and at 9' below surface would be taken, leaving the middle of the lake unsampled. Isn't it best to try to sample the top, bottom and the middle of the water column? Also, how were (or will) the actual locations within these waterbodies as described in Tables 3-1, 3-2 and 3-3 chosen? Were they based on areas of groundwater inflow, stream inflow, overland flow patterns, accessibility, or a combination of these?

22) Table 3-3, page F-46: as noted in footnote 1, it states that these sites will be monitored for water quality once a month for a 12-month period of time. Does this mean that the other sites (w/o Footnote 1) will be monitored more or less frequently? Also, Rice Lake should have a "3" footnote as it is an access issue as stated in Table 3-1.

23) Page F-47: Section 3.2.2; Stream Flow Monitoring: How will NMC determine whether changes to flow are from the mine, due to climatic reasons, or due to changes associated with beaver dams? The use of a reference stream is not mentioned.

24) Table 3-7: Page F-53/54: This Table states the monitoring frequency of the Creeks and Lakes during construction and operation of the mine. The water bodies that are proposed to be sampled annually need to be reviewed and a better reasoning needs to be given as to why annual sampling would be sufficient. Several of the water bodies that are proposed for annual monitoring should be switched to quarterly simply due to the interest in these bodies (Swamp Creek at SG-AA, Rolling Stone Lake at LG-9) and also due to the possibility of runoff or airborne contamination from the TMA (Hemlock Creek and Creek 33-8).

25) Page F-55; Section 3.2.3: Water Quality Monitoring: Same comment as comment no. 21 above.

26) Page F-55; Section 3.2.4: Sediment Sampling: GLIFWC has proposed a newer type of

sampling to determine water quality in addition to sediment sampling called bryophyte sampling. This should be considered in addition to the water quality and sediment sampling proposed within this monitoring plan.

27) Table 3-9 is mislabeled: it should be labeled “post construction” or “reclamation period” as mentioned within Section 3.3.2. Also, this list should be identical to the list within Table 3-4 at least until all the water levels within the project area are stabilized to pre-mining conditions.

Chapter 4: Air
28) Page F-59/60: Section 4.1: Sampling Locations: If sampling locations are based on significant population areas, predominant wind directions, and potential sensitive receptors, then there needs to be several more monitoring stations than that proposed within this plan. As proposed, there is nothing to indicate that this monitoring plan utilized these criteria. None of the population bases in the area, the Town of Crandon, Mole Lake Reservation, Forest County Potawatomi Reservation, etc. are covered by the three air monitoring sites that are presently proposed. There is not even a proposed monitoring location (predominantly) downwind from the TMA. Also, will deposition from the site be occurring closer to the site or further out; should the monitoring locations be tiered, based on proximity? Is one sampling event every six days enough to determine if there are any air concerns? What happens if the wind direction does not match the sampling locations during that one day in six?

Chapter 5: Terrestrial Ecology:
29) Page F-64: Section 5, second paragraph: The terrestrial ecology monitoring program should not be tied just to the air quality monitoring program. Especially since this monitoring plan only proposes 3 air monitoring locations, this tie-in to the terrestrial monitoring does not seem sufficient; more air sampling stations are needed. Areas of disturbance or stressed vegetation, as mentioned in Section 5.1, also will be part of the terrestrial monitoring program.

30) Page F-64: Section 5.1: Vegetational Stress: Are there aerial photos from past years that could lend themselves to being a baseline? According to this Section, all photos will be obtained during July to coincide with the sensitive growth phases of the potentially affected ecosystems. Aren’t plants normally stressed during the summer heat of July/August? How will vegetational stress related to climate be differentiated from project-related stress? The second paragraph states that the aerial photos will be discontinued after mine closure and reclamation. The aerial photos should continue until all the area groundwater levels are back to pre-mine conditions.

31) Page F-65; Section 5.2: Tissue Sampling: First full paragraph on this page describes the dividing of the site into three sectors, as shown in Figure 5-1. These three sectors do not match up with the three air monitoring stations that were proposed in Chapter 4 of this monitoring plan. (i.e., there is no proposed air monitoring location within the southern sector.) In order to better tie in the terrestrial ecology monitoring with the air quality program, as mentioned in comment no. 29 above, more air monitoring stations need to be proposed within each of these sectors.

32) Table 6-1: Page F-67: Will wetlands not listed within this table be “monitored” via the aerial

photos to be taken as per Section 5.1? If aerial photos show a change to wetlands not listed within Table 6-1, will appropriate action be taken to investigate the change and mitigate if needed?

33) Page F-70; Section 6.3: Sampling Frequency: The second paragraph states that all of the wetlands will be monitored once during the growing season prior to the beginning of construction. If the monitoring in the year prior to construction is a drought year or excessively dry year, is the data from the 80's and 90's sufficient to provide an adequate baseline for each of the wetlands, so that the wetlands are not primarily defined by the results of a drought-year survey? Also, in the third paragraph, it states that the monitoring schedule, if no impacts seen within the first five years of yearly monitoring, will be reduced to one event every five years until reclamation is complete. What is the justification of converting from a once/year monitoring to once/every five years? Why not review every three years to coincide with the aerial photography of the project area?

Chapter 7: Aquatic Biology:

34) Page F-71: In the beginning of the monitoring plan, page F-7 to F-8, one of the objectives of the plan is to, "acquire biological data to verify that the surface water mitigation plan, the mitigation measures..., and compliance with applicable...standards are maintaining the quality of surrounding biological resources." (Note: Resources should probably be expanded to include resources and the ecosystem). On page F-71, this objective has been greatly reduced in terms of aquatic biological resources to mean only fish populations and rice plants. The plan should include monitoring of other aquatic communities. Specifically, the monitoring plan should include more than one assemblage, probably periphyton, benthic macro-invertebrates, and fish. More than one assemblage is necessary because each type provides information on different types of impacts and for different waterbodies, all of which could be impacted by mining construction, operation, and decommissioning. Using fish as the only aquatic community would not take into account short term effects of possible contamination, site specific problems (fish can migrate away from impacted waters), or contamination in smaller streams where fish are less prevalent than are macro invertebrates. To further make this point, attached (See Attachment 1) is reference information from a draft EPA Document "Revision to Rapid Bioassessment Protocols For Use in Streams and Rivers: Periphyton, Benthic Macro invertebrates, and Fish; EPA 841-D-97-002.

35) Page F-71, Section 7.1: As stated in this Section, Wisconsin's regulations protect the most sensitive species. The most sensitive species may include taxa other than fish. At a minimum, macro invertebrate communities should also be monitored, and other organisms (ie., bryophytes) should be considered as well (See comment no. 34 above).

36) Pages F-71/72: Sections 7.1.1 (Swamp Creek) and 7.1.2 (Hoffman Springs and Creek): The sampling frequency within these Sections seem more geared towards decreasing frequency - what happens if problems are observed, will the monitoring occur more frequently? Switching to a once/5-year monitoring seems inappropriate considering the importance of the fish to the

Native Americans in the area. The fish within Hoffman Springs/Creek need to be sampled for metals and not just monitored for population. Also, why is the aquatic monitoring only limited to Swamp Creek, Hoffman Springs and Creek 19-14? Any stream or lake that may be in need of mitigation should be included in the aquatic monitoring program. Also, the reasoning for sampling only brook trout is not suitably justified. Electrofishing in the Fall of 1998 revealed that there are at least 17 species in Swamp Creek. In each reach sampled, all fish species should be identified and recorded. Any visible anomolies (ie., tumors) should also be recorded. In addition, more than one reach of the Creek should be sampled.

37) Page F-72; Section 7.2: Have there been any studies to show that aerial photographs at the scale proposed (1"=660') is adequate to determine vegetative stress in wild rice? The thresholds of change will need to be clearly defined.

Chapter 8: Reporting:
38) Section 8.1: Page F-74: The reports also need to include maps of the sampling locations in which the data applies. Since all the Sections within Chapter 8 state that the reports will be submitted to the WDNR, with no mention of the COE, will a complete separate monitoring and reporting plan be followed for the COE's requirements?

Appendix A: TMA Environmental Monitoring Plan:
39) Page F-98: Section 3.2: Baseline and Operational GW Monitoring Program: Wells within the MIB around the TMA need to be more than just Water Table wells. For example, contaminants that may originate from TMA Cell 3 could be deeper than the water table screens, so by the time the contaminants reach monitoring wells within the MIB on the west side of the TMA, there could be a problem. A figure showing the profile of these wells along with the profile of the TMA would be helpful in this Section.

40) Pages F-102-104: Section 3.2.4.1: Baseline Monitoring: Baseline monitoring of the TMA area groundwater should include, as it states in the first paragraph of this Section, parameters identified during waste characterization as likely to be in the tailings. If wastes from the lab, foaming agents, and other possible organic substances are to be disposed of within the TMA, they should be included in the baseline analysis. Several rounds of as an extensive list as reasonable should be conducted, including appropriate organic compounds and their breakdown products. Even if compounds are not regulated under NR 140, as it states in the third paragraph of this Section, they still should be monitored to indicate releases from the TMA. Also, the two phases of the baseline monitoring program, as described in the first full paragraph on Page F-104, is confusing and should be clarified. Is there a 12-month baseline program for the wells around TMA-1A and another 12-month baseline program for wells around TMA-2 for a total of two years of baseline data gathering in the TMA area?

41) Page F-104: Section 3.2.4.2: Operational GW Quality Monitoring: The quarterly-sampled parameter list needs to be expanded to include other parameters as discussed in comment no. 40 above. If zinc is listed as a quarterly parameter, why isn't copper? The list will also need to be modified based on results of annual sampling. If a parameter is seen within the annual sampling,

it should then be sampled for the next couple of years on a quarterly basis. Also, if a parameter is seen within the leachate sampling, it should automatically then be included within the quarterly groundwater sampling program.

42) Page F-108: What is the significance of the labeling of the TMA cells as TMA-1, 1A, 2 and 3, instead of 1-4? This was discussed briefly during the meeting in Rhinelander, but it needs to be better explained within this Section.

43) Page F-109: Section 3.3: Long-Term Care Period GW Monitoring Program: What is the duration of this sampling? Also, this Section refers back to the parameters within Table 3-3 but doesn't state if only the quarterly sample parameters will be included or both the quarterly and the annual parameters. Overall, this Section needs to be more detailed. There is no mention that the list of parameters may be expanded based on past sampling rounds or based on leachate sampling results.

44) Page F-110: Section 4.2.1: Operations Period: The second paragraph states that during operations the process water chemistry, which will be routinely analyzed, will be indicative of the tailings pore water chemistry and therefore routine pore water sampling is not proposed. Wouldn't the process water be more dilute than the pore water in the tailings within the TMA? More explanation is needed.

45) Table 4-2: Periodic full-scan of inorganic and appropriate organic parameters needs to be conducted on the TMA leachate to better determine what parameters need to be monitored in the leachate and the groundwater wells around the TMA.

46) Page F-119: Section 6: Reclaim Pond Liner: Where will the water destined for the reclaim pond go when the reclaim pond is out of service?

47) Page F-120: Section 7.1: Visual Inspection: Annual visual inspections of the TMA cap are not sufficient and need to be more frequent. Inspections should be made at a minimum after the winter thaw and, as proposed, at the end of summer.

Overall, these Plans need to be revised to incorporate the need for the federal government to protect tribal trust resources and area wetlands above and beyond the requirements as set by the WDNR. NMC must either revise these Plans or submit a complete monitoring package to the COE that addresses all the federal concerns related to this project.

Thank you for the opportunity to provide comments to you on these NMC documents. I believe that an elaborate monitoring and mitigation plan, without any chance of misinterpretation, needs to be planned up front on projects with the potential to impact large complex areas. As mentioned above, most of the comments are meant to clarify these Plans. More comments will be forthcoming covering the Surface Water Mitigation Plan and the Monitoring Plan, as well as on other aspects of the project as it progresses.

If you have any questions regarding any of these comments, please do not hesitate to call me at 312-886-7252

Sincerely,

Daniel J. Cozza, Crandon Mine Project Manager
U.S. Environmental Protection Agency

cc: w/enclosure

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**ATTACHMENT 1**
**Comments on the Crandon Mine Monitoring Plan**

From the draft EPA Document "Revision to Rapid Bioassessment Protocols For Use in Streams and Rivers: Periphyton, Benthic Macro invertebrates, and Fish: EPA 841-D-97-002. Bold has been added for emphasis. Also, a selective summary of these in table format is included.

**Advantages of Using Periphyton**

- Algae generally have rapid reproduction rates and very short life cycles, **making them valuable indicators of short-term impacts.**
- As primary producers, algae are most directly affected by physical and chemical factors.
- Sampling is easy, inexpensive, requires few people, and creates minimal impact to resident biota.
- Relatively standard methods exist for evaluation of functional and non-taxonomic structural (biomass, chlorophyll measurements) characteristics of algal communities.
- **Algal assemblages are sensitive to some pollutants which may not visibly affect other aquatic assemblages**, or may only affect other organisms at higher concentrations (i.e., herbicides).

**Advantages of Using Benthic Macro Invertebrates**

- **Macro invertebrate assemblages are good indicators of localized conditions**. Because many benthic Macro invertebrates have limited migration patterns or a sessile mode of life, they are particularly well-suited for assessing site-specific impacts (upstream-downstream studies).
- Macro invertebrates integrate the effects of short-term environmental variations. Most species have a complex life cycle of approximately one year or more. Sensitive life stages will respond quickly to stress; the overall community will respond more slowly.
- Degraded conditions can often be detected by an experienced biologist with only a cursory examination of the benthic assemblage. Macro invertebrates are relatively easy to identify to family; many "intolerant" taxa can be identified to lower taxonomic levels with ease.
- Benthic Macro invertebrate assemblages are made up of species that constitute a broad range of trophic levels and pollution tolerances, thus **providing strong information for interpreting cumulative effects.**
- Sampling is relatively easy, requires few people and inexpensive gear, and has no detrimental effect on the resident biota.
- Benthic Macro invertebrates serve as a primary food source for many recreationally and commercially important fish.
- **Benthic Macro invertebrates are abundant in most streams. Many small streams (1st and 2nd order), which naturally support a diverse Macro invertebrate fauna, only support a limited fish fauna**.
- Most state water quality agencies that routinely collect biosurvey data focus on Macro

invertebrates (Southerland and Stribling 1995). Many states already have background Macro invertebrate data. Most state water quality agencies have more expertise with invertebrates than fish.

**Advantages of Using Fish**

- **Fish are good indicators of long-term (several years) effects** and broad habitat conditions because they are relatively long-lived and mobile (Karr et al. 1986).
- Fish assemblages generally include a range of species that represent a variety of trophic levels (omnivores, herbivores, insectivores, planktivores, piscivores). They tend to integrate effects of lower trophic levels; thus, fish community structure is reflective of integrated environmental health.
- **Fish are at the top of the aquatic food web and are consumed by humans**, making them important for assessing contamination.
- Fish are relatively easy to collect and identify to the species level. Most specimens can be sorted and identified in the field by experienced fisheries professionals, and subsequently released unharmed.
- Environmental requirements of common fish are comparatively well known. Life history information is extensive for many species, and information on fish distributions is commonly available.
- Aquatic life uses (water quality standards) are typically characterized in terms of fisheries (coldwater, coolwater, warmwater, sport, forage). Monitoring fish provides direct evaluation of "fish propagation" and "fishability", which emphasizes the importance of fish to anglers and commercial fishermen.
- Fish account for nearly half of the endangered vertebrate species and subspecies in the United States.

| Selected Advantages of Using a Variety of Assemblages for Biological Monitoring | | | |
|---|---|---|---|
| | **Algae** | **Macro invertebrates** | **Fish** |
| **Temporal use** | Valuable indicators of short-term impacts. | Annual: Sensitive life stages will respond quickly to stress; the overall community will respond more slowly. | Good indicators of long-term (several years) effects and broad habitat conditions |
| **Impacts detected** | Most directly affected by physical and chemical factors. Algal assemblages are sensitive to some pollutants which may not visibly affect other aquatic assemblages, or may only affect other organisms at higher concentrations | Made up of species that constitute a broad range of trophic levels and pollution tolerances, thus providing strong information for interpreting cumulative effects. | Tend to integrate effects of lower trophic levels; thus, fish community structure is reflective of integrated environmental health |
| **Resources required** | Sampling is easy, inexpensive, requires few people, and creates minimal impact to resident biota. | Sampling is relatively easy, requires few people and inexpensive gear, and has no detrimental effect on the resident biota. | Fish are relatively easy to collect and identify to the species level. |
| **Locational uses** | | Macro invertebrate assemblages are good indicators of localized conditions.<br>Benthic Macro invertebrates are abundant in most streams. Many small streams (1st and 2nd order)[1], which naturally support a diverse Macro invertebrate fauna, only support a limited fish fauna. | Broad habitat conditions because they are relatively long-lived and mobile |

[1] This is a headwater ecosystem and the Crandon Mine monitoring plan does envision the need to monitor small streams. Fish may not be the best assemblage to use on these streams.